

STUDIES IN WESTERN VIOLETS—II

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New Species and Varieties

In 1930 I spent the month of August in the Rocky Mountain National Park studying the general flora, particularly the violets. The forms of *Viola* in Colorado differ quite radically from those on the Pacific Coast. I did not find a single form that could be said to be just like the representative on our coast. Besides, Colorado has many species that are not found at all in the Pacific States, such as *V. rugulosa* Greene, *V. scopulorum* Greene, *V. biflora* L., *V. renifolia* Gray, *V. pedatifida* Don, *V. Rafinesquii* Greene, *V. canadensis* L., and *V. Nuttallii* Pursh. Many species of the western coast grow here in altered form, as *V. adunca* Sm., *V. palustris* L., *V. nephrophylla* Greene. Since few of the *Viola* species were in bloom in August, I brought back many transplants which I have since kept under observation in my garden.

In this article I wish to give the results of my study of several of these violet forms. I came in contact with three relatives or forms of *V. adunca*. One of these is *V. bellidifolia* Greene, the alpine representative of this large and varied group. It is abundant at Fall River Pass along the continental divide up to 12,000 feet and probably higher. Although it has some fairly good characters, it varies greatly and further studies may demonstrate that its proper classification is as a subspecies of *V. adunca*. At lower elevations I found two other new forms of *V. adunca* which I have described farther on in this article.

I was unable to find typical *V. palustris* L. in the regions of the Park which I explored, but instead, in habitats where one would expect to find this species, there was an abundance of a plant similar to it but with pure white, fragrant flowers and a slightly different leaf outline. Farther on in this article this plant is described as a new subspecies.

In a marsh at Moraine Park, a young girl of the neighborhood pointed out to me a violet of the acaulescent group which is closely allied to *V. nephrophylla* Greene, but which is smaller with early leaves purple tinted on the lower side and mature leaves glaucescent later in the season. All of the petals are more or less bearded, while in *V. nephrophylla* the bearding is confined to the three lower petals. Another distinguishing character is the shortness of the lower petal. These characters identify it unmistakably as *V. cognata* Greene which botanists have generally regarded as synonymous with *V. nephrophylla*. Although in my opinion this violet should be relegated to a subspecies, it is as much entitled to specific rank as many of the accepted species in this *Boreali-Americanae* group. *V. cognata* is the prevalent form in Colorado, Wyoming, and Utah.

In the early summer of 1933, Alice Eastwood and John Thomas Howell collected in Pine Valley, southwestern Utah, a small-leaved, long-peduncled form, clearly of the *V. nephrophylla* group, but more slender and delicate and, strange to relate, pubescent. On first examination, this seemed to be a species that had escaped botanical description. Greene's account of *V. arizonica* fitted fairly well, but he goes out of his way to state that the whole plant is glabrous. However, a comparison of this sheet with Greene's type showed them to be the same species. The leaves of Greene's type specimen revealed on careful examination a slight pubescence and this made the identification certain. So far as I have been able to ascertain this is the second collection of *V. arizonica*, the first having been made at Post Spring, Fort Verdi, April, 1888. In my opinion, this violet is clearly entitled to specific rank.

1a. *VIOLA ADUNCA* Sm. subsp. *typica* nom. nov. *V. adunca* Sm. Rees, Cyclop. 37: no. 63. 1817.

1b. *VIOLA ADUNCA* Sm. subsp. *Ashtonae* subsp. nov. A subsp. *typica* differt planta omnino glabra, floribus pallidioribus, capsula apice valde emarginata; tuba stigmatosa a stylum perpendiculare, foramine diam. 0.3 mm.

Type: transplant from Cub Lake Trail, Estes Park, Colorado, summer, 1931; cultivated at Kenwood, California, April 8, 1933, *M. S. Baker 7348* (Univ. Calif. Herb. 540629).

Stems 10-15 cm. long, trailing or erect, widely branching, the lower portions more or less buried in the soil, springing from a strong woody tap root; herbage wholly glabrous; leaf blades ovate-cordate, conspicuously obtuse, thickish, greyish green, distinctly crenate, lower nearly as wide as long, 3 cm. wide, 3.2 cm. long (maximum length), upper leaves relatively longer, 2.5 cm. wide, 3 cm. long (maximum length); sinus of leaves shallow, 3-5 mm. deep; stipules linear with a few linear teeth, 4-5 mm. long, 1 mm. wide; lower petioles 2-6.5 cm. long, upper shorter; flowers pale blue, 1.5 cm. in diameter on slender peduncles 4.3-7.5 cm. long, ascending or prostrate, bracteate above the middle, the bractlets filiform, 2-3 mm. long; sepals oblong-ovate to oblong-lanceolate, scarious margined, acute, 4-5 mm. long, auricles small, scarcely 1 mm.; petals obovate, upper 4.5 mm. wide, 10 mm. long, lateral 4 mm. wide, 9 mm. long, bearding long and white, lower 5 mm. wide, 10 mm. long; spur slightly flattened laterally, 2.5 mm. wide, 3 mm. long; stamen-sheath as in other violets of the section *Nomimum*; spur appendages strap-shaped, approximately equal, closely appressed, 1 mm. wide, 3 mm. long; head of style barely exerted from stamen-sheath, covered above and on the sides with beards, which are about one-third the diameter of the head in length, stigmatic tube at right angles to style, foramen .3 mm. in diameter (pl. XI, fig. 4); capsule ob-

ovate, purplish, triangular in cross section, deeply notched at distal end, 5 mm. wide, 5-6 mm. long (pl. XI, fig. 7); seeds light brown, cylindrical-ovoid, 1.07 mm. wide, 2.35 mm. long, caruncle large, lateral and terminal, projecting approximately one-fifth the length of seed beyond the point.

This violet is known only from the Rocky Mountain National Park on the trail from Moraine Park to Cub Lake. It was collected near the lower end of the trail and again a few miles farther on near Cub Lake. The altitude of the first station is about 8000 feet and of the latter perhaps 8500 feet. At both stations the plants were in moist ground and in partial shade. I have had plants from both stations under observation in my garden for several years. Here they are much depressed, the stems trailing and the long peduncles nearly prostrate. The flowers, pale blue, are strikingly different in color from those of the Pacific Coast forms of *V. adunca* which are much darker. The bearding on the lateral petals of *V. adunca* subsp. *Ashtonae* shows as two white patches, the capillary hairs being white in color. The notched capsules distinguish this subspecies from other forms of *V. adunca* except subspecies *radicosa* which, although having similar notched capsules, is densely covered with a fine pubescence. Altogether this is a very distinct form which eventually may prove to be of higher rank than a subspecies. It is named in honor of Mrs. Aven Nelson (née Ruth Ashton) who assisted me materially in my study of the flora of Rocky Mountain National Park.

1c. *VIOLA ADUNCA* Sm. subsp. *radicosa* subsp. nov. A subsp. *typica* differt foliis basi minus cordatis vel saepe solummodo truncatis, acuminis elongatioris, capsulis apice valde emarginatis; rhizoma radices plures ferens; tuba stigmatosa lata dorsum et prorsus directa, foramine magnitudine fere capitulo aequante; herba pilis brevibus retrorsis ubique dense tecta.

Type: Kawuneeche Valley, 12 miles north of Grand Lake, Colorado, August 25, 1930, *M. S. Baker 4772* (Univ. Calif. Herb. 540628).

Plants 5-12 cm. high, stems erect or ascending, much branched, the greater part often buried and bearing adventitious roots, the whole springing from a deep-seated woody tap root; herbage densely covered everywhere with a short and mostly retrorse pubescence; leaf blades 2.3-3.1 cm. wide, 2.5-3.5 cm. long, ovate with a subcordate or truncate base and often with an acuminate tip which is however conspicuously obtuse, shallowly and irregularly crenate; sinus of leaves shallow or none, never more than 2-3 mm. deep; petioles conspicuously winged, those of the lower elongated, 3-7.8 cm. long, upper much reduced; stipules inconspicuous, narrow, almost subulate, sparingly toothed and these narrow, 4-7 mm. long, .5-1 mm. wide; flowers pale blue with a

paler center about 16 mm. in diameter, on peduncles apparently shorter than the leaves, bibracteate near the flowers, the bractlets narrowly linear, 6-7 mm. long; sepals glabrous, lanceolate, scarious margined, acute, slightly auricled, distinctly nerved; petals obovate, upper 6 mm. wide, 10 mm. long, the lateral 5 mm. wide, 9 mm. long, abundantly bearded with long white hairs, the claw with a wide flange which overlaps the lower petal; lower petal, notched at distal end, 7 mm. wide, 11 mm. long; spur variable, laterally compressed, curved downward, 4-6 mm. long; anterior appendages of stamens tan colored, spur-appendages strap-shaped, closely appressed, 4 mm. long; head of style exerted 1.5 mm. from stamen-sheath, minutely bearded with short stiff beards on top and side of head, stigmatic tube short, directed forward and downward, foramen .30 mm. in diameter (pl. XI, fig. 5); capsule obovate, triangular in cross section, distinctly notched at summit, 6 mm. wide, 7 mm. long; seeds unknown.

This violet was first seen by me in Kawuneeche Valley, Colorado, growing in the protection of shrubs (mainly *Potentilla fruticosa*). A few days later it was found some twenty miles farther south on the same highway beyond Grand Lake. The leaf outline is distinctive for the *V. adunca* group, being less cordate at the base, often only truncate, and with greater elongation at the tip than is usual in *V. adunca* subsp. *typica*. The underground portion of the plant is interesting. It consists of numerous slender stems which spring from the crown of a woody taproot, several inches below the soil surface. From the lower part of these stems grow innumerable adventitious roots, thus a complicated and highly efficient absorptive system is gradually built up as the plant becomes more deeply buried.

This violet resembles *V. bellidifolia* Greene in the configuration of the style and stigma and in the complex root system. It has in common with *V. adunca* subsp. *Ashtonae* the only notched capsules known in the *V. adunca* group but differs from it in the shape of the stigma (pl. XI, figs. 4, 5) and in being extensively pubescent while subsp. *Ashtonae* is entirely glabrous.

2a. VIOLA PALUSTRIS L. subsp. *typica* nom. nov. *V. palustris* L. Sp. Pl. 934. 1753.

2b. VIOLA PALUSTRIS L. subsp. *brevipes* subsp. nov. A subsp. *typica* differt: planta minore; foliis orbiculatis; floribus candidis, petalis lateralibus omnino imberbibus.

Types: transplant from Estes Park, Colorado, August, 1930, cultivated at Kenwood, California, April, 1934, flowering specimen, *M. S. Baker 7629a* (Univ. Calif. Herb. 540626); transplants from Moraine Park, Colorado, 1930; cultivated at Kenwood, California, August, 1935, plants with stolons and mature leaves, *M. S. Baker 7692b* (Univ. Calif. Herb. 540625).

Plants 5–8 cm. high, wholly glabrous, acaulescent, the leaves, flowers, and stolons springing from a true rhizome which gives rise to numerous adventitious roots; leaf-blades orbicular-cordate with or without a short, very obtuse apical point, regularly and shallowly crenate-serrate, basal leaf-blades 3.6–4.5 cm. wide, 3.7–5 cm. long, the sinus of the larger leaves about 1 cm. deep, nearly closed; petioles of basal leaves 1.6–6 cm. long; stipules ovate, small, thin, entire except for scattered glandular teeth, those of the terminal bud 2.5 mm. wide, 5 mm. long, the others scarious and shrunk; stolons stout, short, 6–9 cm. long, with two or three foliaceous leaves, or exceedingly slender and nearly twice that length, with only scales at the internodes; petaliferous flowers few, pure white, fragrant, 1.2–1.4 cm. across, held well above the undeveloped leaves on peduncles 2.2–3.3 cm. high, bractlets near the middle of the peduncles, approximately opposite, lanceolate, 2 mm. long; sepals ovate-lanceolate, scarious margined, obtuse, slightly auriculate, lower 4 mm. long, 1.5 mm. wide; upper petals obovate with nearly round limb 4.5 mm. wide, 7 mm. long; lateral petals obovate, *beardless*, 5 mm. wide, 10 mm. long; lower petal 5 mm. wide, 6 mm. long, deeply concave; spur conical, its free tip 1.5 mm. long; spur appendages scarcely touching each other and projecting backwards but slightly; anterior appendages enclosing all but the head of style, this small, naked, with a slight rim dorsally and laterally; stigmatic tube short, directed downward and forward, foramen .16 mm. in diameter (pl. XI, fig. 6); capsule oblong-ovoid, triangular in cross section, somewhat truncate at apex, 4.5 mm. by 9 mm.; seeds nearly black with a small lateral caruncle reaching to the point of seed, 1.48 mm. long, .96 mm. wide, weighing .5 mg.

This subspecies abounds in moist rich shaded soil along streams and lakes of Colorado at elevations of 7500 to 10,000 feet. I found it throughout the region of Estes Park, at Dream Lake, Moraine Park, Bear Lake, Loch Lomond, Glacier Creek. I have seen a sheet from Tolland collected by Edmund R. Cross, and one from Gunnison County along Ohio Creek near Mt. Carbon collected by W. W. Eggleston. These two sheets are in Brainerd's Herbarium, and are labelled *V. palustris* L. At the Rocky Mountain Herbarium and in Coulter and Nelson's "Flora of the Rocky Mountains," subsp. *brevipes* is known as *V. blanda* Willd. because of the fragrant, pure white flowers and beardless petals. However, it lacks the pubescence on the leaves and the reddish color of capsules and peduncles, both characteristic of *V. blanda*. It is not a woodland plant but has the habit of *V. palustris* and more nearly the leaf form, though the leaves are less pointed; the capsules and seeds are nearly identical except for a somewhat smaller size. This plant is smaller in every way than typical *V. palustris*: in size of flowers, capsules, and seeds, and in length of petioles and peduncles; hence its name. More-

over, the petals are pure white while those of typical *V. palustris* are usually pale lavender, and even when apparently white have a faint lavender cast. Another marked variation in this subspecies is the entire lack of beards on the lateral petals, which in typical *V. palustris* are abundantly bearded.

3. *Viola simulata* sp. nov. Planta ut *V. Langsdorffii* excepta caulibus brevibus horizontalis non erectis, herba nullius succulenta, foliorum marginibus accurate crenatis (non crenati-ser-ratis); stipulis minoribus; floribus minoribus; calcare minore; stylo nudo apice parum incrassato; tuba stigmatosa brevissima, lateraliter compressa, foramine diam. 4 mm.; semina pallida, 2.3 mm. longa, 1.4 mm. lata, pondere 2 mg. caruncula parva laterale, acumen parum excedenti; floribus cleistogamis pluribus floribus patentibus florere desistitis.

Type: near Shawnigan Lake, Vancouver Island, British Columbia, May 9, 1915, *J. H. Henry* (Calif. Acad. Sci. 48407).

Plant 7-15 cm. high, leaves and flowers arising from short horizontal stems which are the annual extensions of the slender buried branching rootstock; herbage glabrous throughout; leaf-blades cordate-ovate with or without an obtuse apical point, conspicuously crenate, 3.4-4.5 cm. wide, 3-5 cm. long, with a sinus 7-10 mm. deep; petioles 1.3-12 cm. long; stipules oblong-lanceolate, thin but foliaceous, entire except for microscopic glandular teeth, soon becoming scarious, 5-7 mm. long, about 3 mm. wide; flowers relatively large, violet with a paler center, about 2.5 cm. in diameter on peduncles 5-12 cm. long, the minute bractlets below the middle; sepals broadly ovate-lanceolate without auricles, the lateral largest, 7 mm. long, 2.8 mm. wide at base; petals broadly obovate, medium violet in color with lighter base, lateral petals with abundant capillary beards near base, upper and lateral petals about 8 mm. wide, 16 mm. long, lower 11 mm. wide at broadly emarginate tip, 18 mm. long including 2 mm. spur; stamen-sheath as in other violets of section *Nomimum*; spur appendages projecting downward and only slightly backwards into the short spur; style enlarged but slightly at end, naked, stigmatic tube extremely short, compressed laterally, foramen .4 mm. in diameter (pl. XI, fig. 2); capsule oblong-ovoid, somewhat truncate at tip, 6 mm. wide, 13 mm. long; seeds light brown, caruncle small, lateral, extending slightly beyond the point, 1.4 mm. wide, 2.3 mm. long; weight about 2 mg.; cleistogamous flowers abundant after open flowers have ceased (pl. XI, fig. 1).

For many years this violet has been confused with *V. Langsdorffii* Fisch. It was first discovered at Shawnigan Lake, Vancouver Island, by Mr. J. K. Henry and was identified by Ezra Brainerd as *V. Langsdorffii*. In Bulletin 224, Vermont Agricultural Experiment Station, one of Henry's plants from this locality

is shown in a colored plate (species no. 73). Although resembling the Langsdorff violet in a general way, it differs in many particulars. While *V. Langsdorffii* is a succulent plant, with fleshy petioles and peduncles, this species shows little or no succulence. The creeping stems are short, advancing only a centimeter or two in a season, and are never erect as in *V. Langsdorffii*. The stipules are much smaller; also the flowers, which have narrower petals and a smaller spur. The leaves are less pointed and with the margin crenate instead of crenate-serrate as in the Alaskan species. The characters enumerated above might be looked upon as variations, were not the pistils so entirely different. These are shown in figures 2 and 3 (plate XI), both enlarged ten diameters. In figure 2, three views of the pistil are shown, *a* being a front view, *b* a side view, and *c* a dorsal view. Note the massive style head and stigmatic tube or beak in *V. Langsdorffii* (pl. XI, fig. 3) while in *V. simulata* the style is scarcely expanded into a head and the stigmatic tube projects but little. *V. simulata* is also closely related to *V. palustris* L. having the same creeping rootstocks, similar leaves, and somewhat similar flowers. Fresh pistils are, however, very different, *V. palustris* having the style head expanded into a disk, while in *V. simulata* the style head is merely rounded. The most marked difference is perhaps the entire lack of stolons in *V. simulata*, while in *V. palustris* filiform stolons are abundant. *V. simulata* has been collected at Shawnigan Lake also by myself in 1924, and by Mrs. Viola Brainerd Baird in 1933. Typical material was collected by Dr. N. L. Gardner in 1895 on Camano Island, Puget Sound.

The material collected by Thomas Howell in 1887 at the mouth of the Columbia River, and the collection of A. S. Foster south of Westport, Washington, April 27, 1908, need further investigation, though both collections appear to be *V. Langsdorffii*.

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EXPLANATION OF THE FIGURES. PLATE XI

Fig. 1. *Viola simulata*, habit sketch of transplant from Shawnigan Lake, V. I., $\times 1$.

Fig. 2. *Viola simulata*, pistil $\times 10$: *a*, viewed from anterior end; *b*, side view; *c*, dorsal view.

Fig. 3. *Viola Langsdorffii* from Alaska, pistil $\times 10$, side view.

Fig. 4. *Viola adunca* subsp. *Ashtonae*, pistil $\times 10$: *a*, viewed from anterior end; *b*, side view; *c*, dorsal view.

Fig. 5. *Viola adunca* subsp. *radicosa*, pistil $\times 10$: *a*, viewed from anterior end; *b*, side view; *c*, dorsal view.

Fig. 6. *Viola palustris* subsp. *brevipes*, pistil $\times 10$: *a*, viewed from anterior end; *b*, side view; *c*, dorsal view.

Fig. 7. *Viola adunca* subsp. *Ashtonae*, capsule $\times 10$, side view.

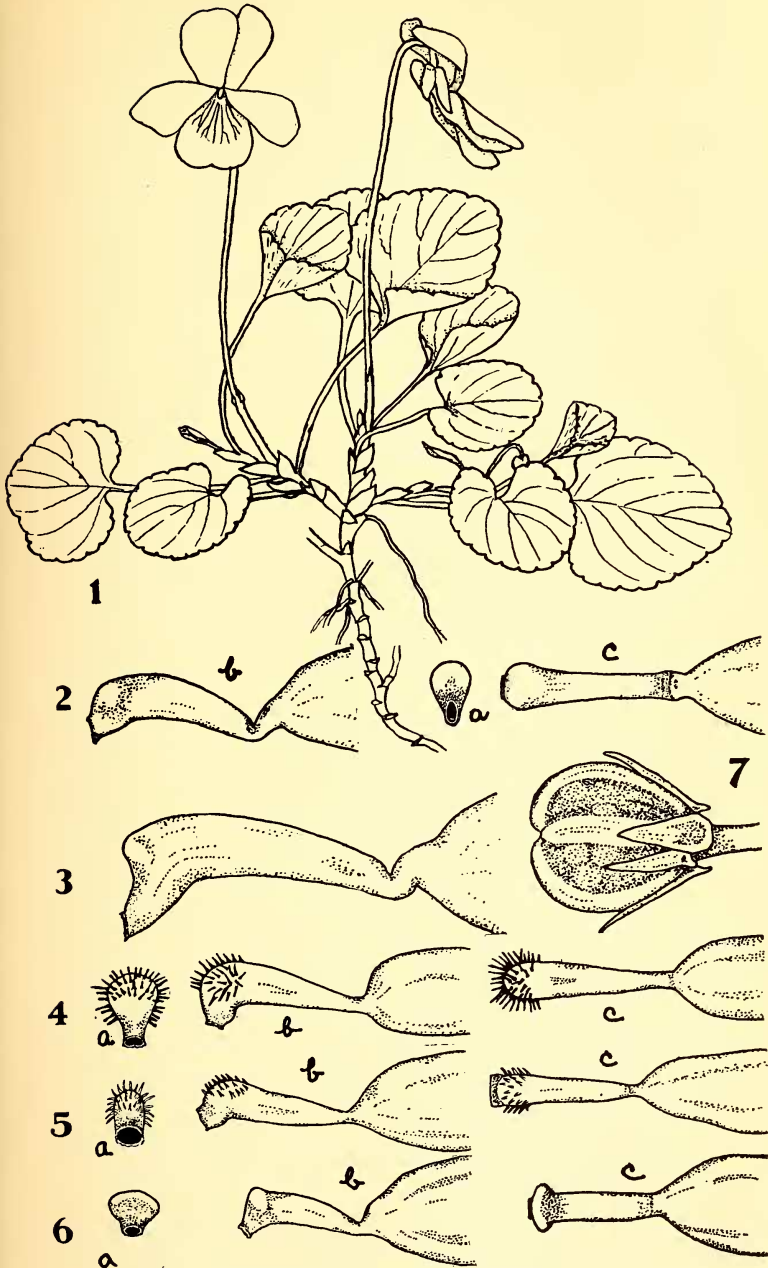


PLATE XI. STUDIES IN VIOLA.